

Remarks

The title of the invention is amended to read "POTASSIUM GLYPHOSATE FORMULATIONS." The new title is descriptive.

Claims 101, 102, 104, 138-140 and 144, which were indicated as "withdrawn" in the listing of claims filed on 23 January 2004, are now canceled without prejudice to their patentability and presentation in a continuation application. Claims 1-66, 77-90, 94, 95, 98 and 105-109 were canceled in that action.

Claims 91-93, 96, 97, 99, 110-137, 141-143, 151, and 172-178 are canceled in this response without prejudice to their patentability and presentation in a continuation application. Claims 100, 103 and 145-150 are withdrawn.

Claims 67 and 152 are amended to require glyphosate, predominantly in the form of the potassium salt. Support is provided by former claims 72 and 157. Claims 72, 157 and 162 are amended to require a weight ratio of the surfactant to the dicarboxylic acid of from about 5:1 to about 50:1. Support is provided at page 102, lines 7-8 of the specification.

Upon entry of the amendments, claims 67-76 and 152-171 will be pending.

Rejection of claims 67-76 and 152-171 under 35 U.S.C. §103(a)

Reconsideration is requested of the rejection of pending claims 67-76 and 152-171 under 35 USC §103(a). Applicants submit that those claims are patentable over the combined teachings of **Ward** et al. (US 6,093,681), **Wright** et al. (US 5,750,468), **Suzuki** et al. (US 6,313,074), **Beestman** et al. (US 4,159,901) and **Hasabe** et al. (US 5,863,863).

The Office states that: **Ward** teaches aqueous formulations containing glyphosate and a surfactant (such as an alkoxylated etherammonium) which form anisotropic aggregates on the waxy cuticle of a plant; **Wright** teaches aqueous concentrates having a glyphosate concentration of up to 500 g a.e./L and containing alkoxylated etheramine, etherammonium or etheramine oxide surfactants, and optionally further including additional surfactants such as alkyl polyglucosides; **Suzuki** teaches that glyphosate may be combined with a chelating agent such as oxalic acid and activity enhancing additives such as alkylglycoside, alkyl polyglycoside, polyoxyalkylene alkylpolyglycodies, polyoxyethylene alkylamine or polyoxypropylene

alkylamine surfactants; **Beestman** teaches that it was known to formulate glyphosate with surfactants such as alkoxylated alkylamines; and **Hasabe** teaches that oxalic acid or a salt thereof enhances the herbicidal activity of glyphosate in combination with a tertiary alkoxylated amine surfactant.

A. The Present Invention

The applicants have discovered and disclosed that aqueous pesticide formulations containing a herbicide, such as the potassium salt of glyphosate, surfactants that form anisotropic aggregates ("AA") and/or liquid crystals ("LC") on or in the foliage of a plant, and other adjuvants such as dicarboxylic acids facilitate the introduction, uptake and translocation of glyphosate throughout the plant and thereby increase herbicidal efficacy over herbicidal formulations currently available.

The applicants have discovered surfactants that are particularly compatible with potassium glyphosate and that form concentrates having improved viscosity, storage stability and potassium glyphosate loading as compared to glyphosate concentrates known in the art (see the specification at page 9, lines 14-18; page 11, lines 4-30; page 12, lines 6-18; page 13, lines 6-23; and page 79, line 32 to page 80, line 31). The inventive compositions are storage stable over a wide range of temperatures (see the specification at page 11, lines 4-8; and Examples 66-69).

The applicants have also surprisingly discovered that the interaction of potassium glyphosate and certain surfactants in aqueous compositions can result in the formation of AA and/or LC on waxy plant surfaces, whereas similarly formulated compositions but containing IPA glyphosate instead of potassium glyphosate do not form AA and/or LC. For example, in reference to Example P of the instant specification see: (1) page 149 line 25 as compared to page 150 line 8 where the ethoxylated tertiary amine surfactant Ethomeen T/15 formed AA and LC when combined with potassium glyphosate, but not when combined with IPA glyphosate; (2) page 153, lines 1-2 as compared to page 153, lines 12-13 where LC formed when an alkoxylated primary amine surfactant was combined with potassium glyphosate, but not when combined with IPA glyphosate; (3) page 154, lines 11-12 and 16 as compared to page 154, lines 21-22 and page 155, line 1 where LC formed when an ethoxylated quaternary amine surfactant was combined with potassium glyphosate, but not when combined with IPA glyphosate; (4) page 156 lines 4-5 as compared to page 156, lines 8-9 where AA and LC formed when an alkylated quaternary amine surfactant was combined with

potassium glyphosate, but not when combined with IPA glyphosate; and (5) page 160, lines 18-25 as compared to page 160, lines 29-31 and page 161, lines 1-3 and 5-6 where combinations of cationic and nonionic surfactants formed AA and LC when combined with potassium glyphosate, but not when combined with IPA glyphosate.

The applicants have further discovered that a weight ratio of surfactant to oxalic acid ("OA") of from 5:1 to 50:1 is preferred for the enhancement of glyphosate efficacy.

B. The Pending Claims

Claim 67, and the claims that depend therefrom, are directed to an aqueous mixture containing the potassium salt of glyphosate, a dicarboxylic acid and a surfactant, wherein upon application of the formulation to the foliage of a plant, anisotropic aggregates comprising the surfactant are formed on the foliage of the plant.

Claim 152, and the claims that depend therefrom, are directed to an aqueous mixture containing the potassium salt of glyphosate, a dicarboxylic acid and a surfactant, wherein upon application of the formulation to the foliage of a plant, anisotropic aggregates comprising the surfactant are formed on the foliage of the plant, and plant growth control in excess of that of a reference formulation devoid of the dicarboxylic acid but otherwise similarly formulated.

Claim 162, and the claims that depend therefrom, are directed to an aqueous mixture containing glyphosate or a salt or ester thereof, a dicarboxylic acid and a surfactant, wherein upon application of the formulation to the foliage of a plant, anisotropic aggregates comprising the surfactant are formed on the foliage of the plant, and wherein the weight ratio range of the surfactant to the dicarboxylic acid is between about 5:1 and about 50:1.

C. The Cited Art

Hasabe does not describe or suggest compositions containing the potassium salt of glyphosate as required by claims 67 and 152. Hasabe, at col. 5, line 24, generically describes "...glyphosate...or the salts thereof," but particular salts are not described or suggested. The working examples describe only the IPA salt of glyphosate. In particular, Example 2 describes tank mixes containing IPA glyphosate and Example 3 describes concentrates containing 30.4 wt.% a.e. (360 g a.e./l) IPA glyphosate. Many salts of glyphosate are known to those skilled in the art of herbicide

formulations (see for example page 2, lines 2-9 of the specification of the instant invention). For instance, in U.S. Patent No. 3,799,758, Franz described the preparation of over 100 different salts of glyphosate. It is known by the skilled artisan that the selection of the glyphosate salt affects properties such as glyphosate solubility (see page 2, line 30 to page 3, line 10) and surfactant compatibility (page 3, lines 11-13, and page 6, lines 6-17). Also, as shown in section A above, applicants have discovered compositions containing potassium glyphosate that form AA or LC, whereas similarly formulated compositions containing IPA glyphosate do not form AA or LC. One skilled in the art would not have been motivated by Hasabe to form a composition containing the potassium salt of glyphosate, a dicarboxylic acid and a surfactant that forms AA on the foliage of a plant. Nor does Hasabe describe or suggest compositions containing a surfactant that forms anisotropic aggregates on the foliage of a plant as required by claims 67, 152 and 162.

Hasabe does not describe or suggest a weight ratio range of surfactant to OA between 5:1 and 50:1 for efficacy enhancement as required by claim 162. Hasabe provides a general disclosure of a surfactant to OA molar ratio between 10:1 and 1:10 (a weight ratio based on tallowamine ethoxylate (15EO) between about 1:1 and about 100:1) for optimization of surfactant stability (column 2:8-33). Hasabe thus incorporates OA for a different purpose than claimed by applicants. In particular, as reported in example 1 (Tables 1 and 2), OA or a salt thereof is added to the surfactant to achieve temperature stability. Example 1 evaluated surfactant stability in the absence of glyphosate and at a fixed weight ratio of surfactant to oxalate (acid equivalent basis) of 3.9:1 (molar ratio of 1:3). Herbicidal efficacy is described in working examples 2 and 4, but at a fixed surfactant to oxalate a.e. ratio of about 3.9:1; efficacy enhancement at any other ratio is not described or suggested. One skilled in the art seeking to enhance glyphosate efficacy would not have been motivated by Hasabe to formulate a surfactant and a dicarboxylic acid in a ratio of at least 5:1.

Ward does not describe or suggest compositions containing a dicarboxylic acid as required by claims 67, 152 and 162. Ward discloses a method of applying a pesticide (e.g., glyphosate) to a plant, the method comprising contacting plant foliage with the pesticide and contacting the same foliage with a first amphiphilic excipient substance that forms anisotropic aggregates in or on a wax layer in the presence of a second excipient substance. Dicarboxylic acids are not taught or even remotely suggested.

Wright describes compositions containing up to 500 g a.e./l glyphosate and etheramine surfactants, but does not describe or suggest such compositions further containing a dicarboxylic acid or a surfactant that forms anisotropic aggregates on the foliage of a plant as required by claims 67, 152 and 162.

Suzuki does not describe or suggest compositions containing the potassium salt of glyphosate as required by claims 67 and 152. Column 7:30-31 and 7:50-51, generically describes "...glyphosate...or the salts thereof," but particular salts are not described or suggested. In reference to the above discussion of Hasabe, many salts of glyphosate are known to those skilled in the art of herbicide formulations, and the only glyphosate working example in Suzuki is example 1 which is directed to the IPA salt of glyphosate.

Suzuki does not describe or suggest compositions containing surfactants that form anisotropic aggregates on the foliage of a plant as required by claims 67, 152 and 162. Nonionic alkoxyated alcohol agricultural chemical enhancers optionally comprising a surfactant are generically described at column 3:9 to 3:57. Anisotropic aggregate formation by the enhancer or surfactant is not described or suggested.

Suzuki does not describe or suggest any efficacy enhancing effect of dicarboxylic acids as required by claims 67, 152 and 162. Suzuki discloses at column 3:66 to 5:21 that chelating agents may be added to the enhancer, with dicarboxylic acids being but one example in a long list of chelators described at column 4:1-57; preferred chelators are not identified. Suzuki does not suggest that the chelators cause any pesticidal enhancement. Working example 1, Table 3 (at column 11) is directed to tank mixes of IPA glyphosate and various components which are described in Table 2 (at column 10), with components 4, 5 and 18 being directed to EDTA (a tetra-carboxylic acid chelator) and component 9 being directed to NTA (a tri-carboxylic acid chelator). Working examples for dicarboxylic acids such as OA are not provided. Suzuki thus teaches away from the present invention and would have lead one of skill in the art to conclude that chelators having three or four carboxylic acid groups are preferred over dicarboxylic acids. This conclusion is contrary to Applicants' discovery.

Beestman does not describe or suggest compositions containing the potassium salt of glyphosate as required by claims 67 and 152, surfactants that form anisotropic aggregates on the foliage of a plant as required by claims 67, 152 and 162, or any efficacy enhancing effect of dicarboxylic acids as required by claims 67, 152 and 162. In particular, glyphosate salts other than the IPA salt are not described or suggested. Beestman describes adding OA to IPA glyphosate in tank mixes formed from hard

water (i.e., water containing 2000 or more parts per million of calcium or magnesium ions) to restore the herbicidal activity lost by the presence of the ions. Thus Beestman describes the use of OA as a chelator to maintain herbicidal activity and does not disclose or suggest that herbicidal activity can be increased by any dicarboxylic acid. Beestman generically describes various nonionic, cationic and anionic surfactants, including tallowamine ethoxylates, at column 3:18-63 that can be used in agricultural formulations, but does not describe or suggest that the surfactants can form anisotropic aggregates. Moreover, Beestman does not describe surfactant concentrations thereby preventing surfactant to OA ratios from being determined.

D. Patentability of the pending claims under 35 U.S.C. §103(a) over the cited art

As detailed in **C** above, Applicants respectfully submit that the **Suzuki, Ward, Wright, Suzuki** and **Beestman** references taken singly do not disclose or suggest each element of claims 67, 152 and 162, nor the claims that depend therefrom.

Moreover, the cited art taken collectively does not disclose or suggest a combination having the components of claims 67, 152 and 162, nor the claims that depend therefrom.

1. Claims 67 and 152 are patentable under 35 U.S.C. §103(a) over the cited art

Hasabe, Suzuki and **Beestman** are devoid of any teaching or suggestion of compositions comprising the potassium salt of glyphosate as required by claims 67 and 152.

Hasabe, Wright, Suzuki and **Beestman** do not describe or suggest surfactants that form anisotropic aggregates on plant foliage as required by claims 67 and 152. **Ward** describes the formation of AA on plant foliage by glyphosate formulations containing a surfactant, but dicarboxylic acids are not described or suggested.

Hasabe, Ward, Wright, Suzuki and **Beestman**, are totally devoid of any suggestion of the unexpected discovery that the interaction of potassium glyphosate, oxalic acid and certain surfactants in aqueous compositions can result in the formation of AA and/or LC on waxy plant surfaces, whereas similarly formulated compositions containing IPA glyphosate instead of potassium glyphosate do not form AA and/or LC.

Claims 67 and 152 are therefore patentable over the combination of **Hasabe**,

Ward, Wright, Suzuki and Beestman because those references would not have motivated one of ordinary skill in the art to select the potassium salt of glyphosate, a dicarboxylic acid and a surfactant to prepare a formulation that, upon application of the formulation to a plant, forms anisotropic aggregates comprising the surfactant on the foliage of a plant. Moreover, one skilled in the art would not have had a reasonable expectation of success in increasing herbicidal bioefficacy in making such a selection.

2. Claim 162 is patentable under 35 U.S.C. §103(a) over the cited art

Hasabe, Wright, Suzuki and Beestman do not describe or suggest surfactants that form anisotropic aggregates on plant foliage as required by claim 162. **Ward** describes the formation of AA on plant foliage by glyphosate formulations containing a surfactant, but dicarboxylic acids are not described or suggested.

Suzuki and Beestman fail to teach that dicarboxylic acids can increase herbicidal bioefficacy, while **Wright** is devoid of any description of dicarboxylic acids. Those references would not have motivated one of ordinary skill in the art to select a dicarboxylic acid and one would not have had a reasonable expectation of success in increasing herbicidal bioefficacy in making such a selection.

Hasabe does not describe or suggest a preferred surfactant to OA weight ratio range of 5:1 to 50:1 for efficacy enhancement as required by claim 162. **Hasabe** teaches a surfactant to OA weight ratio of between 1:1 and 100:1, but for a different purpose (i.e., IPA glyphosate formulation stability) than required by claim 162 (i.e., glyphosate efficacy enhancement). **Hasabe** teaches that OA can enhance the efficacy of formulations containing IPA glyphosate and a surfactant, but at a fixed surfactant to OA weight ratio of 3.9:1.

The deficiencies of **Ward** cannot be cured by the importation of the teaching of **Hasabe, Wright, Suzuki and Beestman**. The combination of references do not teach every element of claim 162 because an efficacy enhancing surfactant to OA weight ratio of from 5:1 to 50:1 is not taught or suggested by any of the references.

Without reference to the teaching of the instant invention, one would not have had a reasonable expectation of success of achieving efficacy enhancement in formulations comprising glyphosate, a surfactant that forms anisotropic aggregates on plant foliage, and a dicarboxylic acid in a weight ratio of surfactant to dicarboxylic acid from about 5:1 to about 50:1 as required by claim 162. Therefore, the combination of references, when viewed by one skilled in the art, would at best have been obvious to

try, which without reasonable expectation of success is an improper standard for rejection under 35 U.S.C. §103(a). The courts have consistently held that the test for a *prima facie* case of obviousness is not whether an invention is obvious to try.¹ Instead, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to combine the references, and there must be some reasonable expectation of success. The Office has not met this legal standard.

The Office states that the motivating force for combining the references is "because they disclose the utility enhancing effects of additives in glyphosate compositions." A determination of obviousness requires evidence which establishes not merely what one skilled in the art might be led to attempt, but that she have a reasonable basis in the art for expecting to succeed. "The invention must be viewed not with the blueprint drawn by the inventor, but in the state of the art as it existed at that time."² Moreover, it is improper to use the claims as a frame from which individual naked parts of separate prior art references may be employed as a mosaic to recreate the claimed invention.³ The cited art is silent, and does not even suggest the combination of the features of claim 162. The law requires not merely a rational hope, but a concrete basis to expect success. Applicants therefore respectfully submit that the cited art, singly or in combination, provides no teaching, motivation or suggestion for the composition of claim 162.

E. Conclusion

For the foregoing reasons, it is respectfully submitted that the Office has failed to establish that claims 67, 152 and 162, nor the claims that depend therefrom, are *prima facie* obvious in view of Ward, Wright, Suzuki, Beestman and Turner. Therefore, Applicants submit that claims 67-76 and 152-171 meet the requirements under 35 U.S.C. §103(a) and are in condition for allowance.

¹See *In re O'Farrell*, 7 U.S.P.Q.2d 1673, 1680-81 (Fed. Cir. 1988).

²quoting *Interconnect Planning Corp. v. Feil* 227 USPQ 543 at 547 (Fed. Cir. 1985).

³*Id.* at 551.

MTC 6647.2
PATENT

Enclosed is a check in the amount of \$420.00 for a two-month extension of time under 37 C.F.R. §1.136(a). The Commissioner is hereby authorized to charge any underpayment or credit any overpayment to Deposit Account No. 19-1345.

Respectfully submitted,



James D. Harper, Reg. No. 51,781
SENNIGER, POWERS, LEAVITT & ROEDEL
One Metropolitan Square, 16th Floor
St. Louis, Missouri 63102
(314) 231-5400

JDH/kll

Express Mail No. EV 432650975 US